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and dunes to ground and underground water is fully discussed.

THE PREGLACIAL KANAWHA.

THE effect of drift obstructions in altering the courses of rivers in western Pennsylvania and eastern Ohio has been recognized for a number of years, the northward discharge to Lake Erie having been thereby greatly decreased. The diversion of the Missouri from a northward discharge to its present membership in the Mississippi system is also credited to glacial obstruction, and the important service of the great western river as a guide to western exploration, early and late, on our side of the Canadian boundary may, therefore, be credited, along with the water powers of New England, to the glacial period. Still another example of this kind is noted in the 17th Annual Report of the Geological Survey, in which the Director mentions a discovery by F. Leverett, with reference to the ancient drainage of the Virginias. The Kanawha, uniting with other streams in the western part of West Virginia and eastern Kentucky, ran in preglacial time northward towards Lake Erie, along a line partly coincident with the course of the south-flowing Scioto to to-day. This makes the preglacial drainage of the St. Lawrence include headwaters in North Carolina. The existing Ohio can, therefore, no longer be interpreted as of ancient origin, as if still flowing along a consequent course between paleozoic uplifts on the north and south-east. It is a composite stream of post-glacial date. As a glacial product, it has been of even greater service than the Missouri, for our early settlers in its fertile lower valley took great advantage of its well-graded course, along which their advance was much easier than if they had had to go up and down hill, across the grain of various north-flowing rivers.*

*Some of my correspondents have pointed out that

THE RIVERS OF SAGINAW BAY.

A NUMBER of years ago Gilbert described the course of the Maumee river in northern Ohio, showing that its peculiar back-handed branches were consequent upon the faint relief determined by moraines and glacial lake beaches. A recent essay by Taylor (*Correlation of Erie-Huron beaches with outlets and moraines in southeastern Michigan*, Bull. Geol. Soc. Amer., VIII., 1897, 31-58) now gives another example of a very similar kind and warrants the recognition of these back-handed branches under some appropriate name, ready for convenient use when still other members of the class shall be discovered. Saginaw river, with its Cass and Tittibawasee arms, and swampy head opposite the upper course of Grand river, repeats the essential features of the Maumee to a nicety.

Back-handed branches resulting from the migration of divides quite independently of glacial constraint are easily distinguished from the class here considered. The barbed arrangement of the upper branches of the Maira recently diverted from the Inn on the watershed of the Alps are of this second class.

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CURRENT NOTES ON METEOROLOGY.

CHALK-PLATE WEATHER MAPS.

ONE of the recent improvements in the methods used by our Weather Bureau deserves mention in these Notes. As is generally known, the daily weather maps issued from the various Weather Bureau stations over the country have for some years been reproduced by a stencil process which, although a good method, when carefully examined, suggests a suggestion regarding the origin of Teay valley (*SCIENCE*, II., 1895, 40) independent of the Kanawha, is inadmissible; for the valley contains gravels that could only have come from the upper Kanawha. Its origin by Big Coal river, therefore, seems out of the question.

ecuted, for a limited number of maps, becomes inadequate when several hundred copies have to be struck off. As a result of experiments, Mr. J. W. Smith, local forecast official of the Weather Bureau at Boston, Mass., suggested what is known as the chalk-plate printing process. It is as follows: A thin covering of specially prepared chalk ($\frac{1}{8}$ in. in thickness) is spread upon a steel plate of the size of the prospective weather map. On this chalk are engraved, by means of suitable instruments, the various weather symbols, the isobaric and isothermal lines, etc. The plate is then stereotyped in the ordinary way. In addition to the weather map proper, there is, of course, a considerable amount of printed matter, such as the forecast, summary, the table of instrumental readings, etc. This textual portion is made up by the use of logotypes, consisting of words, figures and phrases in which the different letters and figures are joined together in one solid piece of type to facilitate the work of setting up. Thus, when the word 'fair' or 'cloudy' has to be used, it is not necessary to set up the individual letters forming the word, but only to select the logotype which prints the word. After the text of the map is set up in logotypes, it is locked up with the stereotype map plate, and the whole is printed at one impression on a sheet prepared for the purpose, which has a blank outline map of the United States at the top, on which the weather map is printed, and space in the lower half of the sheet for the text and tables. The chalk-plate process map is in every way a great improvement on the stencil map which it has superseded. It is smaller, more convenient to handle, more legible and more attractive. A minute study of our daily weather maps is now a distinct pleasure, whereas formerly it was often a difficult task to attempt to puzzle out the faint lines, words and figures, which were too frequently barely legible. The size of

the chalk-plate map itself is $10 \times 6\frac{1}{2}$ inches, and of the whole sheet, which includes also the text and tables, 16×11 inches. The first map made by this process issued from any Weather Bureau station was sent out from Boston on February 29, 1896. Since then the system has been extended as rapidly as possible to the other stations, and at the present time 21 stations issue chalk-plate maps. These are as follows: Boston, Mass.; Cleveland and Columbus, O.; Indianapolis, Ind.; Raleigh, N. C.; Nashville, Tenn.; Chicago, Ill.; Baltimore, Md.; Philadelphia, Pa.; New York and Buffalo, N. Y.; Milwaukee, Wis.; Galveston, Tex.; Louisville, Ky.; Little Rock, Ark.; Montgomery, Ala.; New Orleans, La.; Denver, Colo.; Lincoln, Neb.; Minneapolis, Minn.

PRIZES FOR SCHOOL WORK IN METEOROLOGY.

It is worthy of note in these columns that a definite step has been taken towards encouraging and systematizing school work in meteorology in the New England States. On the dissolution of the New England Meteorological Society, in 1896, a sum of money was left in the hands of a committee, to be used 'for some meteorological purposes.' The committee now offers three annual prizes, of twelve, ten and eight dollars, for the best work on weather and climate in any New England school below the high school, under certain conditions. The papers and record books sent in, in competition for the prizes, are to be wholly the work of the pupils whose names they bear, and all records are to be the result of the pupils' own observations. The committee suggests the following topics as appropriate subjects for such work: (1) Observation and record of simple weather elements. (2) Preparation of weather maps based on data supplied by the teacher. (3) The use of weather maps and of local observations in simple weather predictions. (4) Special observation and study of the elements that control the cli-

mate of New England. A circular giving full details has been issued, and may be procured from the undersigned.

SOME INTERESTING REPRINTS.

PROFESSOR HELLMANN, of Berlin, has recently issued three more of his *Neudrucke von Schriften und Karten über Meteorologie und Erdmagnetismus*. These are: No. 7. EVANGELISTA TORRICELLI: *Esperienza dell' 'Argento Vivo*. ACCADEMIA DEL CIMENTO: *Istrumenti per conoscer l'Alterazioni dell' 'Aria*, containing the most important papers relating to the discovery of the barometer, thermometer and hygrometer, some of them in facsimile. No. 8. HALLEY, VON HUMBOLDT, LOOMIS, LEVERRIER and RENOU, *Meteorologische Karten*, being the earliest synoptic weather charts with wind, isotherms and isobars drawn between 1688 and 1864. No. 9. HENRY GELLIBRAND: *A Discourse Mathematical on the Variation of the Magnetical Needle*, containing the discovery of the secular variation of magnetic declination. This is a facsimile of the very rare work published in London in 1635. A few copies of these pamphlets may be had of A. L. Rotch, Blue Hill Observatory, Readville, Mass., at the publisher's price of 3 marks, or 75 cents each, postpaid.

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CURRENT NOTES ON ANTHROPOLOGY.

THE AGE OF MAN.

In his recently published 'Handbuch der Palæontologie,' Professor Zittel, of Munich, reviews the alleged instances of the discovery of human remains in strata older than the alluvial period. His general conclusion is that "prehistoric researches do not yield positive information or definite results as to the antiquity of the human species." He follows Virchow in rejecting the high antiquity of the Neanderthal skull and denies that any discovery of glacial man in America has yet been made. He

accepts, however, as probably 'fossil or quaternary,' the skull of Eguisheim, the jaw of Naulette and that of the Schipka cave, and the skull of Olmo in Tuscany.

Professor Morselli, who reviews Zittel's conclusions in the 'Archivio per l'Antropologia,' doubts the skull of Olmo, but argues that Zittel is generally too sceptical. He also adds the statement that the fossil human skeleton from the Pampean formation of the Argentine Republic, said by Zittel to be in the Museum of Milan, is not there.

ON SMALL CHIPPED FLINTS.

THERE is a class of small chipped flint objects, with a general similarity of shape and finish, found in England, France, Egypt, India, North Africa and elsewhere. In the *Revue de l'Ecole d'Anthropologie* for November, A. de Mortillet offers a careful study of their forms, geographical distribution, use and antiquity.

They are generally rudely triangular, rhomboidal, or like the segment of a circle. One edge is neatly dressed with secondary chipping, while another is left with the natural cleavage. The length varies from 15 to 35 millimeters. They may have been used as arrow points, as scarificators, as tools, or, in some instances, as fish hooks. In age, they appear to belong to the earliest neolithic period. Their singular similarity does not entail the proof of transmission, but rather of independent development.

While in America there are many specimens generally akin to these described by Mortillet, they cannot be said to represent any distinct culture area or period.

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SCIENTIFIC NOTES AND NEWS.

DR. THOMAS M. DROWN, President of Lehigh University, has been elected President of the American Institute of Mining Engineers.

THE students of the Massachusetts Institute